**FAIRFAX BRIDGE** **HAER No. WA-72**
(James R. O'Farrell Bridge)
State Route 165 spanning the Carbon River
Carbonado vicinity
Pierce County
Washington

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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

PHOTOGRAPHS

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR
P.O. BOX 37127
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HISTORIC AMERICAN ENGINEERING RECORD

**FAIRFAX BRIDGE**
(James R. O'Farrell Bridge)

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| Location: | State Route 165 spanning the Carbon River, 2.8 miles south of Carbonado, Carbonado Vicinity, Pierce County, Washington, beginning at mile point 11.50.<br><br>UTM: 10/572880/5210060<br>10/573000/5210210<br><br>Quad: Wilkeson, Wash. |
| Date of Construction: | 1921 |
| Engineer: | E. A. White, Pierce County Engineer, designer. |
| Fabricator: | Union Iron & Bridge Company, Seattle. Minneapolis Steel and Machinery Company, steelwork. |
| Owner: | Originally built and owned by Pierce County and Washington Department of Highways. Owned solely by Washington Department of Highways by 1945. From 1977, owned by Washington State Department of Transportation, Olympia, Washington. |
| Present Use: | Vehicular and pedestrian traffic. |
| Significance: | It is one of only two extant three-hinged steel arches in the state of Washington. |
| Historian: | Jonathan Clarke, August 1993. |

## History of the Bridge

The building of the Fairfax Bridge across the Carbon River canyon in 1921 was the culmination of years of earnest petitioning by the people of Fairfax. Their campaign for a highway to connect their isolated community to the outside world was skillfully orchestrated by a local county commissioner, James R. O'Farrell, and it was in his honor that the bridge--the final link in this road--was dedicated. The employment of a three-hinged steel lattice arch for the type of bridge was a prudent yet uncommon decision. Greatly suited both aesthetically and structurally to the picturesque and rocky gorge, it now stands as one of only two of its kind in the state of Washington.

Situated some 40 miles southeast of Tacoma, close to the edge of the Mount Rainier National Park, Fairfax was one of a scatter of settlements in the area that grew up on the exploitation of wood and coal. In 1896 the Western American Company began work on sinking a coal mine on the north side of the Carbon River and four years later this was productive. The coal, which was of exceptionally high quality--purportedly the best in the state, and amongst the best in the nation--was primarily used for coking. By 1901 some 60 beehive coke ovens had been built. The monthly output of 2,500 tons was sent to the Tacoma Smelter via the Northern Pacific Railroad line which had been extended from Carbonado to Fairfax in 1898.[1]

The mine passed through many changes of ownership. From 1907 until 1911 the American Smelting and Refining Company, who owned the smelter at Tacoma, managed the colliery. It also started workings on the south side of the river. Following on from this, through the 1910s and 1920s, a succession of other companies and individuals, including the Fairfax Mine, Inc., W. R. Rust, and the Wilkeson Coal and Coke company secured ownership rights to the workings.

The other phase in Fairfax's development, lumber, came soon after the establishment of the mine. In 1910, J. E. Manley, R. D. Moore and August von Boecklin, organizers of the Manley-Moore Lumber Company, bought a large tract of timber and built a sawmill about a mile above the town. The surrounding hills supported dense growths of fir, spruce, hemlock and cedar, and lumbering quickly established itself as a sizeable operation, rivaling that of coal mining. A new community grew up around the mill, boasting some "50 houses, a store with a post office, a schoolhouse, bunkhouses, a doctor's office and a 26-room hotel."[2] Other aspects of the wood-products industry followed, including the Carbon river shingle mill, situated next to the Manley-Moore mill pond. Another, the Ray Shingle Mill, established itself one quarter of a mile west of Fairfax, and soon this was supporting its own settlement called Rayville.[3]

By 1918, a staff correspondent for the Tacoma Daily Ledger was able to observe that:

> Two communities, separated in interests and united in isolation have grown up about the Manley-Moore Lumber Company and the Fairfax Mine, Incorporated. . . . The two of them make Fairfax.

The shared isolation of the two communities had however lead already to at least one common interest: that of pushing for the construction of a road to connect through to Carbonado and hence the rest of the state. The only realistic means of communicating with the outside world at this time was the Northern Pacific Railway to Tacoma, which followed the line of the Carbon River canyon as far as Carbonado, seven miles to the north. This service was both infrequent and lengthy. The train came only twice-a-day and a journey to Tacoma was an all-day affair because of the numerous stops made at neighboring towns to collect coal, lumber, stone and other products.[4] The one alternative, walking to Melmont, which was connected to other towns by a wagon road, was surely an unattractive option.[5]

Agitation for the proposed Carbon river road gained official voice and direction from 1916, when James R. O'Farrell was elected as County Commissioner of district number 1, Pierce County.[6] O'Farrell, the youngest of four sons of Puyallup Valley pioneers, was from nearby Orting.[7] He had worked as both a general contractor, and as a postmaster in his home town before taking up his position as commissioner.[8] His experience as the mayor of Orting for two terms, during which time he demonstrated his concern for local issues--working hard to get industry established--coupled with the friendship and backing of W. H. Paulhamus, bank owner and driving force behind the Puyallup and Sumner Fruit Growing Association, helped secure his success in election. District #1, Pierce County included both Orting and Fairfax, and with O'Farrell's drive and qualities as an orator, it was only a matter of time before Fairfax's ambitions would be realized.[9] O'Farrell began pushing for the road in the same year he took office.[10] By 1918, the first signs of success appeared: bonds were voted for the grading and paving of a stretch of road between Burnett and Fairfax at an estimated cost of $250,000.[11]

The road never materialized however, for the First World War diverted attention away from this and other domestic concerns. Plans were shelved until the completion of the war, by which time a sharp increase in the cost of materials and labor meant that the money that had been appropriated proved grossly inadequate. Undeterred, O'Farrell rekindled county interest in the project.

Plans and specifications of the portion of the proposed Burnett-Fairfax Highway between Carbonado and Fairfax were drawn up in 1919.[12] A meeting of the Pierce County Board of Commissioners on 13 December 1919 decided upon a call for bids for the "clearing, grubbing, and grading" of this stretch of road according to the contract documents, and on 3 January 1920 notice of this appeared in *Buckley Banner*. The project was entitled "Bond Issue Proposition No. 13", and would entail, at some point, the construction of a bridge over the Carbon River.[13]

The contract for the Carbonado-Fairfax road was awarded to Grant Smith & Company for $223,000.[14] By July 1920, however, with considerable work left uncompleted, including much hard rock excavation, construction work ceased. The contractors had completed the contract, but the bond issue funding was exhausted. Commissioner W. E. Williams moved that the work be suspended temporarily. Some $235,000 had been allotted for Bond Issue Proposition No. 13, but one of the County Engineers estimated that a further $30,000 was required to make the road satisfactory for vehicles. An additional $60,000 would also required for the bridge, making the total cost some $325,000, excluding paving.[15] The funding problem had been exacerbated by an earlier decision by Congress not to contribute funds to the project.[16]

In September 1920, with the road still unfinished, O'Farrell decided to submit himself for a second term of office as county commissioner. Eager to see the road completed, he opted for the shorter term of two years, considering this sufficient to accomplish the work. With the strength of public support in the district such as it was, O'Farrell was assured success: the Buckley Banner saw "no doubt of his nomination and election this year."[17]

His new term in office secured, O'Farrell set about ensuring the road's rapid completion. On the 15 January 1921, county commissioners resolved to advertise for new bids for the "improvement " of the Carbonado-Fairfax stretch of road, and the "construction of Melmont Bridge No.16186A, over Carbon River." Two adverts to this effect appeared in the *Pacific Builder and Engineer*, 21 January 1921. That regarding the bridge specified that it was to consist of "a 240-foot steel arch together with concrete abutments and towers and alternate concrete or timber approaches." In both cases the commissioners specified that they reserved the right to reject any and all bids. The bids were to open 10 February, 1921.[18] The working drawings for the bridge had been prepared on 1 January 1921 by E. A. White, the county engineer.[19]

Despite these advertisements, the obstacles facing the road were not over. Some of the County Commissioners opposed the idea of completing the road, arguing that there were more worthy and pressing projects to be attended to first. When a statement of this became public, the Carbon River area became enraged. An emergency meeting was held on 2 February 1921 at the Wilkeson Slavonian Hall. The 75 people who attended represented the towns of Orting, South Prairie, Buckley, Burnett, Spiketon, Carbonado, Puyallup, Sumner, and Montesano. Deep snow prevented a delegation of 25 from Fairfax, travelling in a gas 'speeder' along the Northern Pacific Railroad tracks, from attending the meeting.[20]

The meeting, chaired by C. E. Martin, resulted in the organization of various town committees that were to prove decisive in ensuring the completion of the road. In addition, a road committee was appointed. Robert D. Moore of the Manley-Moore Lumber Company, and William Carli, head of the Miner's Union, were appointed as chairmen.[21]

On the morning of 10 February 1921, the day on which the bids were to be officially opened, the Wilkeson delegation travelled to Tacoma, taking with them a ten piece band. Standing at the north entrance of the courthouse, they serenaded the commissioners throughout their session, hoping to sway their decision in favor of accepting a bid. After a whole mornings deliberations, it was decided that the two bids that had been received for the construction of the bridge--one by Hurley-Mason Company and the other by an unknown bidder--were to be returned to their bidders. Calls for new bids were to be re-advertised.

The outcome represented a compromise between O'Farrell and those commissioners opposed to the road and bridge. The two rejected bids were, in the opinion of those against the project, too high for the county general fund to bear. They struck an arrangement with O'Farrell, whereby the road would be constructed in two sections, each with its own sources of funding. The proposed bridge over the Carbon River, and the one-mile stretch of road leading up to it from Fairfax would be funded by $60,000 of state highway funds appropriated for Pierce County. The second unit of the road, that between the bridge and Carbonado, was to be awarded $40,000 from the county general fund, with the proviso that O'Farrell's district would provide up to $10,000 on top of this if the contract exceeded the available funding.[22]

Bids for the two units of road were re-advertised on 18 March, 1921 in *Pacific Builder and Engineer*, and construction of the two units of road began in April of that year.[23] The contract for the bridge and one-mile of highway was awarded to the Union Iron & Bridge Company, Seattle, under M. M. Caldwell, and the construction was supervised by G. A. Marsh of Portland. The steel-work was fabricated by the Minneapolis Steel and Machinery

Company.[24] The cost of the whole project--some $450,000--was far in excess than that anticipated a year earlier. The bridge alone cost $80,000 to build.[25]

The bridge was the last component of the Carbon River road to be completed, linking a one-mile stretch of road from Fairfax to the south with a seven-mile stretch to Carbonado to the north. For this reason it was chosen as the site for celebrating the opening of the Fairfax road, on 17 December 1921. The event was enormous cause for celebration, and was attended by state and county officials, numerous clubs and practically the entire population of Fairfax. A pilgrimage from Wilkeson to the bridge was followed by speeches, music, and a scenic tour by logging railroad, given by the Manley-Moore Lumber Company.

The chairman of the program committee, C. E. Martin, summarized both the significance of the road and the cardinal role O'Farrell played in ensuring its completion:

> We are assembled in this momentous occasion to celebrate the completion of one of the most needed improvements that has been built in Pierce County in 20 years. . . . We are perfectly sure that had it not been for the fortunate circumstances that our friend, Mr. O'Farrell, was county commissioner from this district, this road and bridge would never have been completed during a lifetime.[26]

The bridge was accordingly dedicated in honor of O'Farrell, and in March 1922 a bronze tablet, 14" x 18" in size, with the inscription "James R. O'Farrell Bridge Sponsored by Sportsmen's Association A.D. 1921," was placed on it.[27]

The significance bestowed in the opening of the Carbon River road and bridge was not however confined to the people of Fairfax and other communities in the area. To motorists in Tacoma, Seattle and other parts of western Washington, it immediately provided a scenic gateway to the upper Carbon River Gorge, notorious as a remote "sportsmens paradise." Two years later, with the completion of both a county funded extension of the road to the edge of the National Forest reserve, and a government funded five-and-one-half mile road linking this to the Carbon River entrance to Rainier National Park, it was to give greater access to the what was already the nation's third most popular National Park.[28]

The 1920s were to see tremendous road building activity in the area by both the county and National Park Service, working in tandem to encircle the mountain and connect up other towns. By 1925 it was possible for the automobile tourist to enter the park either by the Nisqually River canyon on the south or the Carbon River canyon on the north and return by the opposite route.[29] With Seattle only fifty-seven miles away from the park entrance, and Tacoma 40, it is perhaps not surprising that some 200,000 people visited the park in 1925.[30] The changes accompanying the opening up of formerly isolated communities like Fairfax in this new era of the automobile were marked. On 14 April 1926 the *Tacoma Daily Ledger* noted that:

> Since the completion of the road . . . Fairfax now enjoys all the advantages of any small town close to a large city. The daily papers arrive shortly after the editions are printed; radios bring the outside news and entertainments; and automobiles carry pleasure seekers to Tacoma or elsewhere for an evening of recreation.

For most of the inhabitants however, these benefits were to be short-lived; Fairfax's industrial base was already in decline. By the early 1920, the manufacture of coke was decreasing, and in 1925, as a result of frequent strikes and other problems, the mines closed down.[31] A venture in manufacturing coal briquettes from the old mine screenings was successful only for a limited while.[32] The Manley-Moore Lumber Mill closed in 1932, its stands of timber depleted. The closure of the Carbon River Shingle Company followed two years later, its timber supply severed with the sawmill's closure. With the disappearance of these major sources of employment, Fairfax had little to offer its once thriving community, and most of the families migrated elsewhere.[33] Today, with the virtual absence of any local community, the majority of users of the bridge are tourists travelling to the Rainier National Park.

## Design and Description

The Fairfax Bridge consists of a 240' three-hinged, spandrel braced rib, steel deck arch; two 14' steel towers; and eight timber trestle approach spans. The arch proper is made up of a parabolically curved bottom member, the arch rib; a horizontal top chord supporting the roadway; and six pairs of spandrel acting as web trussing.[34]

The upper and lower chords that make up the rib are composed of built-up beams, each made up of four angles and a plate riveted together to form an H-section with a wide, open web. The upper chord and lower chord are connected by vertical and diagonal members, comprised of four angles riveted with lacing in Warren truss configuration, also forming an H-section built-up beam. The struts and members making up the lateral bracing for both the top arch chord and the lower arch chord are similarly built of two latticed channels. Lateral bracing on the top chord is however limited to that between panel points U2 and U3; U5 and U6; U8 and U9; U15 and U16; U18 and U19; U21 and U22. This is because the spandrel posts connect with the arch rib at U3, U6, U9, U16, U19 and U22: lateral bracing was required only at these points to distribute the thrust of the posts both horizontally and vertically through the arched top chord. The six pairs of spandrel posts comprise of latticed channels, and are connected by both struts and sway bracing.

Each of the two towers is made up of four posts, thoroughly connected by struts and sway bracing. Both the tower posts and struts are built of two rolled channels, riveted together with latticing on the outside of the flanges so that the webs are facing one another. The diagonal sway bracing members are composed of two rolled channels, with the flanges facing one another, tied by horizontal plates riveted to the outside of the flanges. On the outer broadside of the tower, adjacent to the slope of the gorge, an additional strut is employed between the intersection of the sway bracing and the mid-point of the strut immediately below it. On the inner broadside, facing the arch, one additional strut is similarly positioned in the upper panel only. This is because either end of the rib occupies the space between the inner tower posts in the lower panel. Accordingly, to compensate for the absence of a lower strut and ensure adequate stiffening, two parallel struts, braced by lacing in a Warren configuration, have been used in place of a single one.

The load of each tower post is carried by cast-steel pedestals, which rest on either of the four corners of two enormous concrete abutments built into either side of the gorge. Each of these abutments is of a web-wall form, the arms of which are deeply embedded into the bedrock, thus presenting a stable platform measuring approximately 17'-6" x 23' for the support of both towers and arch.

The rib of the arch is hinged in three places: at the either extremity of the lower chord (below panel points L0 and L24), and at the junction of the upper and lower chord at the crown of the arch. The two skewback, or outer, hinges comprise of fixed pins inside cast-steel shoes, which rest on inclined concrete thrust footings forming part of the abutments. It is this inclined rather than vertical reaction at the supports that primarily distinguishes the steel arch from the truss or girder form of bridge.[35] The function of the hinges is to act as points of articulation in the rib, where the structure under load is free to rotate. Because of this, temperature stresses resulting from either expansion or contraction of the superstructure are virtually nil. At the center of each hinge, there is a plane of zero bending resulting from this free rotation, and so the thrust line may be definitely located at this point. The stress distribution throughout the whole arch can thus be calculated both simply and with certainty.[36]

The arch supports a shallow Warren stiffening truss with rolled steel I-section floor beams, in turn supporting timber stringers with bridging. This supports a asphalt road surface, 17'-6" wide. A 3'-2" high latticed railing with steel posts, supported by a beveled timber curb and cantilever brackets, runs the full length between either tower. Four "pedestrian refuges" are provided on either side of the roadway above the towers. They were probably an important design consideration, given the anticipated volume of vehicular traffic over what is a single lane bridge.

The two approach spans consist of creosoted timber trestles supporting timber beams, stringers and laminated decking. Both the west approach and east approach are curved in plan, to accommodate the differing orientation of the bridge relative to the road on either side of the gorge. The length of the deck of the east and west approach along their central axis is 103' and 116' respectively. The timber trestles for both approaches are composed of a series of 12" x 12" bents, thoroughly sway-braced in pairs with 3" x 12" members, thus forming three towers on either slope. With the exception of the first bent on either approach, which comprise of concrete slabs, the fourteen other bents all rest on concrete pedestals, sunk most of their 6' depth directly into the ground. On the west approach, no bracing was attached between bent No. 6 and bent No. 7 because when it was built an unsurfaced road which followed the line of the old Northern Pacific Railroad passed through there. Both approach spans were rebuilt in 1945, replacing their original timber counterparts. These were very similar in terms of the number and disposition of the bents: the major change that their reconstruction brought was the addition of a few more struts and sway bracing.

An alternative design for both the towers and approach spans was also prepared by E. A. White, county engineer. Under this scheme, both of these components would have been constructed from reinforced concrete. The towers were each to have consisted of four columns joined by two spandrel beams, giving three openings, two of which were rectangular with truncated corners, while the other, uppermost one, was arched at the top. The top of the towers were corbelled, supporting a balustrade that flanked the pedestrian refuges. The decks of the approach spans were to be of concrete construction, supported by two pairs of doric columns and a concrete abutment. Because the construction costs for this design were probably not prohibitive--the raw materials for the concrete could have been transported directly to the site via the Northern Pacific Railroad Company line. It seems plausible that aesthetic considerations mitigated against this proposal. The monumentality of the structure may have been considered out of place with both the graceful, slender arch it flanked, and the picturesque gorge it was to be built in.

The employment of an arch bridge was almost certainly in response to the challenging nature of the site conditions. In Europe, steel arch bridges had, by the 1920s, established themselves as extremely adaptable in the spanning of deep, rocky ravines. Their use was extremely widespread, partly on account of the long tradition in masonry arch building that tended to shape the way European engineers designed in the new structural medium, steel; partly because of the nature of the gorges that had to be spanned; and partly because European designers were as much concerned by aesthetic considerations as they were by economics. In contrast, American engineers were guided in their designs almost exclusively by questions of economy, simplicity, and occasionally a need for greater rigidity. Also, the conditions that made the use of an arch economical; deep, rocky-sided gorges were not encountered in America to the same degree as in Europe. Such factors tended to ensure the continued popularity enjoyed by the simple truss bridge.[37] In the case of the Carbon river gorge an arch bridge was eminently suitable, because the steep slope dictated an inclined rather than vertical reaction at the supports.

The choice of a three-hinged type of arch construction is perhaps not surprising, given their overwhelming popularity relative to other types in America by the early 1920.[38] They had two principle advantages compared with fixed, single, and two-hinged types. First, they were completely free from temperature stresses. Second, they were virtually immune from vertical or lateral movements in the supporting abutments which would otherwise induce material stresses in the superstructure. Both of these factors may have been major considerations for the Carbon River gorge, on account of both the high annual and diurnal range of temperature, and the nature of the bedrock which might have caused problems with regard to abutment instability. The principal disadvantage of the three-hinge arch was its lack of rigidity.

Because of the difficulty of erecting falsework for the construction of the bridge, it seems likely that the span was erected in two halves from either embankment as a cantilever structure, with final closure being made at the center. In this method, both towers would have been constructed first, to provide the necessary abutments and thrust footings for each of the two skewback hinges. A tie member would then have been pin-connected to the upper chord end panel point of the rib, and tied back into the far side of the concrete abutment. It was probably connected at this end to two U shaped steel bars, located in line with the panel points, and which appear to be deeply embedded into the concrete. A "toggle joint" or eye-bar parallelogram, inserted in this tie member, would have controlled its length, and hence the elevation of the cantilevered arm as it was built outward. This adjustment would have been necessary to enable precise closure of the two halves at the crown. With the rib completed, the deck truss would have been constructed between the towers. This cantilever method was frequently used for the erection of both two-hinged and three-hinged arches.[39]

With the deck standing 250' above water, Fairfax Bridge was claimed to be the highest structure in Washington at the time it was built. Also, despite the relative popularity of this form of arch bridge compared to others, it is one of the only two extant examples in the state.

Repair and Maintenance

The first major alteration for which there is any available record for was the replacement of the original timber approaches and timber deck on the steel spans (contract no. 2950). This was undertaken because of severe rotting to the base of some of the bent posts, at their junction with the concrete pedestals, and because logging trucks and county gravel trucks were causing considerable damage to the deck. The contract was completed on 5 June, 1946 at a final estimated cost of $30,035. The deck was replaced again in 1955 (contract no. 4963) as a result of extensive wear to the concrete surfacing, and once more in 1972 (contract no. 9440), because of rotten and loose deck members.[40]

For the rest of its existence, the bridge has experienced only minor repairs or action to correct such particularities as a bent tower post, broken rails, scoured approach pedestals and accumulated water in the tower post shoes. The bridge has also been sandblasted and re-painted on a number of occasions.[41]

The deck of the bridge is due for at least partial replacement in the near future. Currently, the 4" x 6" treated timber laminated decking is soft throughout. At six locations this has been punched through to the stringers because of truck wheel loads. These areas have been temporarily repaired with steel cover plates. The asphalt covering the decking is cracked transversely over the majority of joints and has 'alligatored' over the most rotten areas. The WSDOT repair program will include replacement of 20% of the existing timber stringers and total replacement of the decking.[42]

## Data Limitations

Despite the rarity of this bridge type within the state, and indeed the relative infrequency of the employment of steel arches within America by the 1920s, it would seem Fairfax Bridge received no mention in the engineering literature. Neither the *Engineering Index*, the *Engineering News-Record*, or the *Pacific Builder and Engineer* formally acknowledge its construction. The latter however yielded useful contractual information in the "notice of bids" section. In the absence of such an article, the actual method of construction must remain informed conjecture.

A particularly useful source was "The Building of the Carbon river-Fairfax road and bridge from The Buckley Banner" by Cindy Calton, obtained from the Tacoma Public Library. A typed compilation of all the local newspaper clippings pertaining to this, it proved invaluable in reconstructing the context in which the road and bridge was built. Unfortunately, neither this, nor other newspaper articles cited in the Tacoma Public Library card index gave any insight into how the bridge was built. In an attempt to answer this, a number of local people, including Nancy Hall and Cindy Calton, were contacted, but to no avail. The only historic photographs located depict the dedication of the bridge, not its construction. These photographs, part of the Boland Collection, are available at the Washington State Historical Society, Tacoma. Two potential sources of information that were not tried because of time limitations are Commissioners Reports etc., at Pierce County Courthouse, and records at the county engineers office, Tacoma.

## Project Information

This project is part of the Historic American Engineering Record (HAER), National Park Service. It is a long-range program to document historically significant engineering and industrial works in the United States. The Washington State Historic Bridges Recording Project was co-sponsored in 1993 by HAER, the Washington State Department of Transportation (WSDOT), and the Washington State Office of Archeology & Historic Preservation. Fieldwork, measured drawings, historical reports, and photographs were prepared under the general direction of Robert J. Kapsch, Ph.D., Chief, HABS/HAER; Eric N. DeLony, Chief and Principal Architect, HAER; and Dean Herrin, Ph.D., HAER Staff Historian.

The recording team consisted of Karl W. Stumpf, Supervisory Architect (University of Illinois at Urbana-Champaign); Robert W. Hadlow, Ph.D., Supervisory Historian (Washington State University); Vivian Chi (University of Maryland); Erin M. Doherty (Miami University), Catherine I. Kudlik (The Catholic University of America), and Wolfgang G. Mayr (U.S./International Council on

Monuments and Sites/Technical University of Vienna), Architectural Technicians; Jonathan Clarke (ICOMOS/Ironbridge Institute, England) and Wm. Michael Lawrence (University of Illinois at Urbana-Champaign), Historians; and Jet Lowe (Washington, D.C.), HAER Photographer.

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## ENDNOTES

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[2] Gatto, "Quiet, Peaceful Fairfax Was a Wild and Busy Town."

[3] "Fairfax Lies at Park Entrance," 19.

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[5] Burns, "Fairfax Isolated but Prosperous."

[6] Nancy Irene Hall, *Carbon River Coal County* (Enumclaw, WA: Courier Herald Publishing Company, 1980), 196.

[7] "J. R. O'Farrell Dies in Orting," *Tacoma News-Tribune*, 27 December 1953.

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[10] An article in the *Buckley Banner* of 15 May 1920 states that "the people of this state have been asking for the Carbon river road every year for four years. . . " See "No Government Funds for Road," *Buckley Banner*, 15 May 1920, in Cindy Calton, "The Building of the Carbon river-Fairfax road and bridge from The Buckley Banner", 1-2. TMs [photocopy], Northwest Room, Tacoma Public Library, Tacoma WA. [Calton, "Building.]

[11] "Open Fairfax Road with Celebration," *Buckley Banner*, 24 December 1921, in Calton, "Building," 6; Alfred Campion, "New Wonderland Within Reach of Motorist," *Western Washington Motorist*, January 1922, 5.

[12] "Open Fairfax Road with Celebration," in Calton, "Building," 6; Hall, *Carbon River Coal County*, 196.

[13] C. A. Campbell and James Norris, "Call for Bids," *Buckley Banner*, 3 January 1920, in Calton, "Building," 1.

[14] "Fairfax Road Work Suspended for a time," *Buckley Banner*, 3 July 1920, in Calton, "Building," 2.

[15] Ibid.

[16] "No Government Funds for Road," *Buckley Banner*, 15 May 1920, in Calton, "Building."

[17] "James R. O'Farrell For Commissioner," *Buckley Banner*, 11 September 1920, in Calton, "Building," 3.

[18] C. A. Campbell and L. L. Dingle, "Call for Bids: Construction of Melmont Bridge No. 16186A, Over Carbon River, Pierce County, Washington," *Pacific Builder and Engineer*, 21 January 1921, 6; and "Call for Bids: Improvement of Burnett Fairfax Highway between Carbonado and Fairfax, Pierce County, Washington," *Pacific Builder and Engineer*, 21 January, 1921, 7.

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[22] Ibid., 197-98; "Fairfax Road May be Built this Year," *Buckley Banner*, 12 February 1921, in Calton, "Building," 3-4.

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[26] "Open Fairfax Road with Celebration," in Calton, "Building," 6.

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[33] Glover, "Once Thriving Fairfax Is Now Ghost Town," 3.

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[35] McCullough, "Steel Arch Bridges--General," 349.

[36] Conde B. McCullough and Edward S. Thayer, *Elastic Arch Bridges* (New York: John Wiley & Sons, Inc, 1931), 155.

[37] Waddell, *Bridge Engineering*, 617-18.

[38] McCullough, "Steel Arch Bridges--General," 363; Waddell, *Bridge Engineering*, 636.

[39] McCullough, "Steel Arch Bridges--General," 369; see also "Steel Arch Highway Bridge Across Colorado River," *Engineering News-Record* 101 (1 November 1928): 646-49; W. Frederick Welsch, "Erecting a 750-Ft. Steel Arch Without Falsework," *Engineering News-Record* 107 (16 July 1931): 94-97.

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[41] Bridge Inspection Reports (1943-91).

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